

# Feasibility and Safety of Laparoscopic Management of Hydatid Disease of the Liver

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## ABSTRACT

**Background and Objectives:** Laparoscopic treatment of hydatid disease of the liver produces encouraging results, though its feasibility and safety have been questioned. We evaluated the feasibility and safety of laparoscopic management of hydatid disease of the liver.

**Methods:** Consecutive patients with this disease reporting to our department from August 1998 to January 2002 were offered laparoscopic management. Our protocol included preoperative albendazole for 4 weeks, laparoscopic cyst evacuation after its sterilization, and deroofting and suction drainage of the cavity, addition of omentoplasty if required, and a follow-up exceeding 6 months.

**Results:** Eighteen patients (M11:F7) with 22 liver hydatid cysts underwent laparoscopic surgery. The mean cyst size was 7.4 cm (range, 5.6 cm to 16.6 cm). Two patients needed conversion to an open operation. Spillage of cyst contents occurred in 5 patients. True recurrence of hydatid disease occurred in the original site in 2 patients (11%), and false recurrence was seen in 2 patients (11%), all within 6 months.

**Conclusion:** With proper patient selection, laparoscopic management of hydatid cysts of the liver is a feasible option with low rates of conversion. Both true and false recurrences are common with conservative laparoscopic options, and undetected ectocysts may be the cause of true cyst recurrence.

**Key Words:** Hydatid cyst, Liver cyst, Laparoscopy, Echinococcosis.

## INTRODUCTION

Surgery has been the principal modality of therapy for the common forms of hydatid disease of the liver (HDL) caused by *Echinococcus granulosus* even though drug therapy with imidazoles and aspiration and scolicedal injection (PAIR [puncture, aspiration, instillation, and reaspiration]) have also been shown to be effective in select subgroups.<sup>1,2</sup> With the explosion of laparoscopic surgery (LS), many surgeons have tried laparoscopic intervention for hydatid cysts of the liver and have had results comparable to those of open surgery with the added benefits of minimally invasive surgery.<sup>3,4</sup> However, many are unconvinced about the role of laparoscopy in HDL because of fears of difficulty in controlling spillage and higher complication and recurrence rates.<sup>5,6</sup> HDL is common in India, and laparoscopic surgical intervention of hydatid cysts of the liver has been in practice in our department since mid 1998. We evaluated the feasibility of LS in the management of HDL and its safety with special reference to peri- and postoperative complications and cyst recurrence.

## METHODS

The feasibility of LS, its perioperative complications, and long-term results were evaluated in all consecutive patients with HDL seen in our department in a tertiary care hospital in northern India from August 1998 to January 2002. The preoperative workup included abdominal ultrasound and contrast enhanced computed tomography scans of the abdomen. The diagnosis of liver hydatid was based on imaging studies and on clinical suspicion. Special attention was paid to exclude the presence of ectocysts (daughter cysts outside the main cyst) by imaging studies. Immunological tests for confirmation of hydatid disease were not routinely done at our center. All patients were given preoperative albendazole 15 mg to 20 mg per kg of body weight daily for 4 weeks. Eligibility for laparoscopic surgery was assessed on clinical grounds and as per imaging studies. Exclusion criteria for LS were (1) severe cardiopulmonary disease unlikely to tolerate prolonged CO<sub>2</sub> induced pneumoperitoneum and deemed unfit for laparoscopy by the anesthesiologists; (2) previous multiple upper abdominal surgery likely to have adhesions and thus limiting vision and increasing the diffi-

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culty level of laparoscopic dissection; (3) recurrent hydatid cyst; and (4) cysts located more than 1 cm deep from the liver surface, which may prove difficult to identify laparoscopically and likely to result in significant bleeding when the overlying hepatic parenchyma is cut with standard laparoscopic instruments using electrical diathermy.

Patient position, the number of ports, and their placements varied according to the location and size of the hydatid cysts. The surgeon usually stood between the legs of the patient placed in a "Y" position, but frequently chose to stand on the left side of the patient for cysts of the right lobe of the liver. After initial laparoscopic evaluation through a supraumbilical or subumbilical port placed in accordance with the lower margin of the liver or the cyst, the suitability of the cyst for LS was confirmed, and the procedure was carried out as established earlier.<sup>3,4,7</sup> Essentially, the following were the steps adopted by us: (1) decompression of the cyst by aspiration of the cyst fluid using a wide bore needle through one of the 5-mm ports or by direct percutaneous entry under laparoscopic guidance taking care to avoid spillage and by the use of at least one continuous suction cannula around the needle puncture site; (2) naked eye examination of the fluid for the presence of bile or pus; (3) sending for confirmation of scolices by microscopy or for culture, if deemed infected; (4) aspiration of as much of the cyst fluid as was possible and injection of equal amounts of hypertonic saline into the cyst without removing the needle, when the aspiration suggested hydatid fluid without any biliary communication; (5) aspiration of the cyst contents after 10 minutes using high-powered suction at a negative pressure of 600 mm Hg to 750 mm Hg (-80 to -100 kPa) through a 10-mm trocar introduced directly into the cyst under vision; (6) in case the location of the cyst did not permit direct trocar entry, a specially designed 10-mm suction cannula with an oblique and sharp end was used for aspiration, which was inserted into the cyst directly or through an opening made at the most nondependent area of the cyst taking care to avoid spillage; (7) instillation of hypertonic saline (15%) into the cyst when no further material could be aspirated with subsequent aspiration; (8) 'sterilization' of the cyst cavity by repeating step 7 until the returns were clear of hydatid elements; (9) direct inspection of the interior of the cyst by introducing the scope into the cyst to look for remaining cyst elements and biliary leakage, if any, for subsequent attention; (10) deroofing as much of the cyst as possible using diathermy; (11) dealing with residual elements, bleeding points, and points of bile leakage, if any, by established laparoscopic techniques; (12) removal

of the cyst wall and cyst elements from the peritoneal cavity by using locally improvised specimen bags to prevent contamination; (13) placement of omentum into the residual cavity if the location or the configuration of the cyst warranted; and, (14) drainage of the residual cyst with a negative suction catheter. We did not use routine cholangiography.

During the procedure, spillage of cyst contents was anticipated and watched for. In case spillage beyond the site of the suitably placed continuous suction cannula occurred, it was promptly aspirated with one or 2 additional suction cannulas that were placed near the site of cyst puncture. In addition, the affected area was treated with hypertonic saline and complete clearance was ensured. Postoperatively, the patients stayed in the hospital as long as the drains were present or occasionally for therapy of any other complication. Albendazole was continued postoperatively for 4 weeks, if there was spillage of cyst contents. Patients were followed up every 3 months for at least 6 months.

## RESULTS

Twenty-three patients underwent LS for deemed hydatid disease of the liver, out of which only 18 patients (M:F = 11:7) with a total of 22 cysts were confirmed to have hydatid disease based on the presence of laminated membrane with or without daughter cysts or scolices. The remaining 5 patients had simple hepatic cysts (3), a right adrenal cyst (1), and an omental cyst (1). The hydatid cysts were solitary in 15 patients and multiple in 3 patients (2 cysts each in 2 patients and 3 cysts in one patient). The size of the cysts varied from 5.6 cm to 16.6 cm (mean, 7.4 cm), and 17 cysts were located in the right lobe and only 5 cysts in the left lobe. Seven cysts were in the superior most region of the liver (segment VII and VIII), and the rest were in the easily approachable anteroinferior aspect of the liver (segments II to VI). The operating time ranged from 45 minutes to 160 minutes with a mean of 102 minutes.

No ectocyst was detected on imaging in any of the patients. Calcification of the cyst wall was noticed in 6 patients, 2 of whom had infected cysts. Infection of the cyst was seen in 2 other patients who had no calcification of the cysts. Cystobiliary communication was observed in 2 patients; in one patient the cystobiliary communication was successfully sutured laparoscopically, and in the other patient, the procedure was converted into an open procedure due to difficulty in laparoscopic suturing owing to dense calcification of the wall. Another patient with a

6.3-cm cyst in segment I was converted to an open procedure because of its location and distortion of the anatomy with a shift of IVC to the left and hepatoduodenal ligament anteriorly, both of which were adherent to the cyst wall.

Minimal spillage (escape of less than 5 mL of clear fluid) was observed in 4 patients, and significant spillage (escape of 2 daughter cysts) occurred in one patient despite the use of continuous suction around the puncture site as recommended.<sup>3,7</sup> The spillage of fluid was around the needle site in 2 patients and around the suction port in the other 2 patients. In all these patients, the cysts were sub diaphragmatic in location when constraints in the space available did not permit appropriate placement of the needle or the additional suction devices around the puncture site. Spillage of 2 daughter cysts occurred when a densely packed hydatid cyst was opened by cautery to facilitate entry of a specially designed 10-mm suction cannula. Direct trocar entry into the hydatid cysts was not associated with any spillage as the trocar fitted tightly through the entry site. Spillage occurred at the time of introduction of the needle or the suction cannula into the cyst. The high-pressure suction was successful in removing the laminated membranes and daughter cysts in all the cases as the clearance of the cysts was confirmed by visual inspection of their interior using a 30° telescope. No other intraoperative complication occurred. Omentoplasty was added to the standard procedure in 6 patients when it was felt that the saucerization was not adequate.

Oral intake was permitted on the first postoperative day in all patients. Early postoperative complications included low-grade fever not accompanied by leucocytosis in 6 patients and persistent drainage exceeding 4 days in 3 cases. One patient had a bile leak persisting beyond 7 days, which was managed by endoscopic biliary stenting for 4 weeks.

All patients were followed up for a mean duration of 14 months (range, 12 months to 36 months). Recurrence of a cystic lesion on serial imaging was noted within 6 months in 4 patients (22%), in 2 (11%) of these within 3 months (symptomatic in one). In all these patients, the recurrence was at the original site of the cyst, and in 2 patients, the size of the recurrent cyst was almost similar to that of the original cyst. US-guided aspiration of the recurrent cysts revealed clear fluid with scolices,<sup>2</sup> clear fluid without evidence of hydatid components,<sup>1</sup> and sterile pus.<sup>1</sup> Only one of those with true recurrence had spillage of fluid during surgery. No recurrence was seen in any of the patients who had infected cysts or who had biliary com-

munication or multiple cysts. Recurrent hydatid disease in the symptomatic patient was managed by open surgery and in the other by aspiration and injection of hypertonic saline. The patient with the sterile pus-filled residual cavity underwent laparoscopic evaluation to exclude the presence of hydatid elements, and the cavity was aspirated, saucerized, and drained laparoscopically with an uneventful recovery. The patient with apparent recurrence having no scolices in the cyst fluid refused surgery or any other intervention and has persistence of the cyst with an insignificant change in its size even after 36 months, and has remained asymptomatic.

## DISCUSSION

The management of HDL is mainly surgical, and a number of surgical procedures have been described to deal with the cyst contents, pericyst, and the residual cavity, and to manage complications, such as biliary communications, biliary hydatidosis, infections, and recurrence.<sup>1,3,5-7</sup> The role of mebendazole initially and albendazole subsequently has been described with varying levels of efficacy.<sup>2,8</sup> Currently, drug therapy is restricted to those who are poor candidates for surgery<sup>8</sup> preoperatively to reduce the risk of intraoperative spillage-induced spread<sup>2,7</sup> and for invasive hydatid disease.<sup>7,8</sup> Ultrasound-guided needle aspiration accompanied by hypertonic saline has the advantage of avoiding surgery, but the procedure is applicable only in select subgroups.<sup>9</sup>

With the explosion of LS, it was inevitable that HDL also would come under the management of laparoscopic surgeons. Initial reservations regarding spillage and the ability to manage the cyst wall have been allayed by reports showing satisfying results with minimal complications using laparoscopic techniques.<sup>3,4,7</sup> A review of the literature reveals that laparoscopic management of hydatid cysts predominantly consists of aspiration of the cyst contents either alone<sup>9</sup> or in combination with deroofing of the cyst wall.<sup>2,3,7</sup> Laparoscopic pericystectomy or even liver resections have been shown to be viable options with good results.<sup>4</sup>

Confusion exists regarding the nomenclature of various surgical procedures, especially about the terms “deroofing,” “unroofing,” “saucerization,” “partial cystectomy,” “partial pericystectomy,” and “partial cystopericystectomy.” Though some authors tend to distinguish them based on the extent of excision,<sup>3</sup> essentially all these terms mean the same thing, ie, resection of as much of the pericyst after evacuation of the cyst contents, thereby converting the cavity into an open space. The known

surgical complications include intraoperative spillage of cyst contents,<sup>1,10</sup> anaphylaxis,<sup>10</sup> hemorrhage, postoperative bile leak,<sup>1,3,11</sup> bile collection in the cavity,<sup>9</sup> infection of the cyst,<sup>9</sup> and wound infection.<sup>11</sup>

The rate of conversion to open procedures varies. Conversion is required due to inaccessibility, calcification, or other complications of the cyst, and occasionally due to technical factors. Both the rate of conversion and complications can be reduced by proper selection of cases: selection of cases with cysts only in the easily approachable area of the liver, ie, segments II, III, IVB, V, and VI, avoiding calcified cysts and those in deeper portions of the liver,<sup>3</sup> or those with biliary communications. In our series of consecutive unselected patients, conversion was required in 2 patients (11%), and both of these conversions could have been avoided by application of the above guidelines.<sup>3</sup>

The most serious problem associated with both open and laparoscopic surgical therapy of HDL is the recurrence of the cyst with persistence of parasitic infection. While near zero recurrence has been obtained with radical operations, such as closed cystopericystectomy and hepatic resections,<sup>1</sup> recurrence rates in excess of 20% have been associated with conservative open surgical procedures like evacuation of cyst contents and pericystectomy.<sup>12</sup> With nonradical and radical laparoscopic treatment of HDL, a number of authors have shown recurrence rates comparable to those of open operations, thereby establishing the safety of LS.<sup>3,7,9,13</sup> A recent report showed no recurrence using a liposuction device, and the authors advocate its supremacy in view of its capability to aspirate viscous and solid organic matter.<sup>14</sup> The negative pressure used by us is similar to or greater than that used in liposuction. In addition, we routinely treated the cysts with a scolicalid agent, and we visually confirmed cyst clearance in all our cases. In spite of these efforts, we still had true recurrence in 2 of our patients. We are disinclined to believe that the recurrence in our patients is due to missed living parasitic elements inside the cyst, as a thorough visual scrutiny of the cyst cavity with a 30° telescope after evacuation is routinely practiced by us.

Laparoscopic experience with HDL has shown that spillage of scolices-rich cyst fluid or daughter cysts is common, and it is difficult to evacuate the cysts without spillage in the absence of the proven techniques available to open surgery.<sup>1,3</sup> Spillage may lead to peritoneal hydatidosis, and hence, every effort should be made to avoid peritoneal spillage and to reduce the chances of peritoneal implantation. The various precautions, which were

adopted during open surgery for HDL to prevent spillage and subsequent reimplantation, can be diligently adhered to during LS.<sup>3,4,7</sup> Additional modifications or special instrumentation have also been suggested to further reduce the risks of spillage.<sup>13</sup> The modifications include preoperative chemotherapy to “sterilize” the cysts,<sup>7,10</sup> direct trocar entry, use of high-pressure suction to aspirate daughter cysts and the laminated membrane,<sup>13</sup> modified trocar with additional length or adherent tip or additional inlet enabling continuous irrigation and suction,<sup>13,15</sup> initial decompression with a needle and replacement with an equal volume of scolicalid agents,<sup>3,7,14</sup> filling the perihepatic area with scolicides,<sup>3</sup> and use of gauze pieces soaked with scolicides.<sup>10,15</sup> Experimental studies have also shown that spillage is less with hyperbaric laparoscopy than with gasless laparoscopy, though excellent results have been achieved with gasless laparoscopic surgery for HDL.<sup>12,15</sup> Our observation that spillage is less when the hydatid cysts are located in more accessible areas where direct trocar entry is possible is supported by others as well.<sup>16</sup>

Our policy of using preoperative albendazole for 4 weeks, needle aspiration initially without spillage, and introduction of scolicalid agents into the cyst, direct trocar entry or use of a special suction cannula, prompt recognition of spillage, if any, and performance of appropriate and adequate action to ensure no live cyst element remains are established measures in the laparoscopic therapy for HDL as per current practice.<sup>3,7,10,14</sup> Still, we had 2 patients out of 18 (11%) who had true recurrence of hydatid disease within 6 months. Our observation that the recurrence is at the same site and nearly the same size does not favor the possibility of recurrence due to spillage. Theoretical explanation for this recurrence points towards a missed endo- or ectocyst growing rapidly to occupy the residual cavity. The recurrence occurring after treatment of the cyst with an established scolicalid agent and after thorough videolaparoscopic examination of the cyst cavity utilizing its advantage of magnification excludes the possibility of a living endocyst left behind. We believe that this recurrence is possibly due to missed ectocysts that escaped the scolicide and our scrutiny due to their ectocystic location. We believe that they escaped detection by preoperative imaging owing to their small size. Ectocyst formation is a natural occurrence with *Echinococcus granulosus* and is responsible for most recurrences, which explains the reason why recurrence is least with resections and pericystectomies.<sup>1</sup> As recurrence due to undetected ectocysts is a frequent cause, identification of such patients with routine ultrasound examination of the cyst after evacuation as advised earlier,<sup>17</sup> preferably with intraoperative ultra-

sonography, would aid in offering more aggressive therapy to this subgroup of patients to eliminate recurrence.

Most recurrences occur after many months.<sup>1</sup> The cause of rapid recurrence and expansion of the cysts within a few months in our series is unknown. The first author has seen a similar rapid recurrence even after an open conservative operation (unpublished data). We believe that such a rapid recurrence arises from undetected ectocysts that expand rapidly due to the availability of free space in the residual cavity with no tissue resistance. We have also had a nonparasitic cyst recurrence, and we concur with the caution given by Ertem,<sup>18</sup> who has also experienced false recurrence in one of his patients, that one should not hasten to operate until characteristic images appear or serological evidence confirms recurrent hydatidosis.

## CONCLUSION

Our experience shows that with appropriate case selection as recommended earlier,<sup>3</sup> LS is a feasible option in HDL with low rates of conversion and perioperative complications. Following LS for HDL, a significant number of patients (22%) have recurrent cystic lesions at the site of the original hydatid cysts, at times, assuming the original size within 6 months. Only half of these patients (11%) have true recurrences, and the rest have false recurrences, ie, nonparasitic fluid collections mimicking recurrent hydatid cysts. The distinction can be made by microscopic examination of the cyst fluid for living elements of the parasite. Spillage of hydatid cyst contents is frequent in LS, and recurrence is not necessarily associated with spillage and vice versa. It appears that some of the uncomplicated hydatid cysts in the liver are not candidates for laparoscopic evacuation and partial pericystectomy because of the high rate of recurrence brought about possibly by undetected ectocysts. Identification of such patients would aid in planning radical surgical therapy in this subgroup of patients to eliminate recurrence.

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